

CLAIM OF BENEFICIAL USE for Transfer with Multiple Changes – Surface Water and Groundwater



Oregon Water Resources Department
725 Summer Street NE, Suite A
Salem, Oregon 97301-1266
(503) 986-0900
www.oregon.gov/OWRD

A fee of \$230 must accompany this form for any Transfer final orders including a water right with a priority date of July 9, 1987, or later.

Example – A transfer involves 5 rights and one of the rights has a priority date of July 9, 1987, or later, the fee is required.

A separate form shall be completed for each transfer.

This form is subject to revision. **Begin each new claim** by checking for a new version of this form at: <https://www.oregon.gov/OWRD/Forms/Pages/default.aspx>

The completion of this form is required by OAR 690-014-0100(1) and 690-014-0110(4).

Please type or print in dark ink. If this form is found to contain errors or omissions, it may be returned to you. **Every item must have a response.** If any requested information does not apply to the claim, insert "NA." **Do not delete or alter any section of this form unless directed by the form.** The Department may require the submittal of additional information from any water user or authorized agent.

"Section 7" of this form is intended to aid in the completion of this form and should not be submitted.\

A claim of beneficial use includes both this report and a map. If the map is being mailed separately from this form, please include a note with this form indicating such.

If you have questions regarding the completion of this form, please call 503-979-9103.

The Department has a program that allows it to enter into a voluntary agreement with an applicant for expedited services. Under such an agreement, the applicant pays the cost to hire additional staff that would not otherwise be available. This program means a certificate may be issued in about a month. For more information on this program see:

<https://www.oregon.gov/OWRD/programs/WaterRights/RA/Pages/default.aspx>

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SECTION 1

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GENERAL INFORMATION

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Type of Authorized Change

This Claim is being submitted for a transfer involving multiple changes.

YES

Mark all that apply:

- | | |
|--|--|
| 1. <input checked="" type="checkbox"/> Change in POD(s) or Additional POD(s) | 4. <input type="checkbox"/> Change in Character of Use |
| 2. <input type="checkbox"/> Change in POA(s) or Additional POA(s) | 5. <input type="checkbox"/> Change in Character of Use – Reservoir |
| 3. <input checked="" type="checkbox"/> Change in Place of Use | |

A separate section will be completed for each type of change authorized in the transfer final order.

1. File Information

APPLICATION # T-13695

2. Property Owner (current owner information)

APPLICANT/BUSINESS NAME Metro, A Municipal Corporation		PHONE NO. 503-806-1626	ADDITIONAL CONTACT NO. 706-254-1083
ADDRESS 600 NE Grand Avenue			
CITY Portland	STATE OREGON	ZIP 97232	E-MAIL Gary.Shepherd@oregonmetro.gov

If the current property owner is not the transfer holder of record, it is recommended that an assignment be filed with the Department. ***Each transfer holder of record must sign this form.***

3. Transfer holder of record (this may, or may not, be the current property owner)

TRANSFER HOLDER OF RECORD Metro, A Municipal Corporation		
ADDRESS 600 NE Grand Avenue		
CITY Portland	STATE OREGON	ZIP 97214

4. Date of Site Inspection:

June 24, 2024

5. Person(s) interviewed and description of their association with the project:

NAME	DATE	ASSOCIATION WITH THE PROJECT
Preet Gujral	6/24/2024	Farmland Stewardship Program Manager
Gary Shepherd	6/24/2024	Owner's Representative

6. County:

Washington

7. If any property described in the place of use of the transfer final order is excluded from this report, identify the owner of record for that property (ORS 537.230(5)):

OWNER OF RECORD Metro, A Municipal Corporation		
ADDRESS 600 NE Grand Avenue		
CITY Portland	STATE OREGON	ZIP 97232

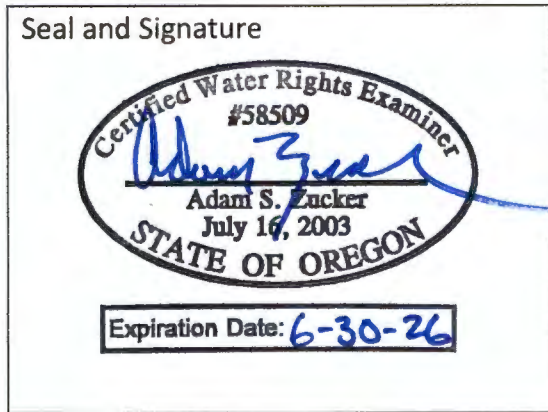
Add additional tables for owners of record as needed

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**SECTION 2
SIGNATURES**

CWRE Statement, Seal and Signature

The facts contained in this Claim of Beneficial Use are true and correct to the best of my knowledge.



CWRE NAME Adam Zucker		PHONE NO. 503-956-3473	ADDITIONAL CONTACT NO.
ADDRESS 4014 SE Ankeny Street			
CITY Portland	STATE OR	ZIP 97214	E-MAIL adam@zuckerengineering.com

Transfer Holder of Record Signature or Acknowledgement

Each transfer holder of record must sign this form in the space provided below.

The facts contained in this Claim of Beneficial Use are true and correct to the best of my knowledge. I request that the Department issue a water right certificate.

SIGNATURE	PRINT OR TYPE NAME	TITLE	DATE
	Gary Shepherd, on behalf of Metro	Senior Metro Attorney	09/18/24

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SECTION 3
Changes Made

Note: The Claim only needs to describe the changes that were authorized in the transfer final order.

Change #1

New or Additional Point of Diversion

Change in POD(s) or Additional POD(s)

Did the transfer order authorize a change in the points of diversion or additional points of diversion? **YES**

If "NO", this Section can be deleted.

1. New or additional point of diversion name or number:

POINT OF DIVERSION (POD) NAME OR NUMBER (CORRESPOND TO MAP)	SOURCE
POD 3	Tualatin River

2. Variations:

Was the use developed differently from what was authorized by the transfer final order, or extension final? **NO**

If yes, describe below.

(e.g. "The order allowed three new/additional points of diversion. The water user only developed one of the points.")

3. Claim Summary:

NEW OR ADDITIONAL POD NAME OR #	MAXIMUM RATE AUTHORIZED IN ORDER	CALCULATED THEORETICAL RATE BASED ON SYSTEM	AMOUNT OF WATER MEASURED
POD 3	0.944cfs		10.957* ac-ft

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System Description

Are there multiple new or additional Points of Diversion (POD)? **NO**

If "YES" you will need to copy and complete Sections A, B, or C in this Section for each POD.

POD Name or Number this section describes (only needed if there is more than one):

POD #3

A. POD System Information

Provide the following information concerning the point of diversion. Information provided must describe the equipment used to appropriate water from the point of diversion.

1. Pump Information

MANUFACTURER	MODEL	SERIAL NUMBER	TYPE (CENTRIFUGAL, TURBINE OR SUBMERSIBLE)	INTAKE SIZE	DISCHARGE SIZE
Berkeley	B3ZPLS	N/A	Centrifugal	6"	6"

2. Motor Information

MANUFACTURER	HORSEPOWER
N/A	30 HP

3. Theoretical Pump Capacity

HORSEPOWER	OPERATING PSI	LIFT FROM SOURCE TO PUMP	LIFT FROM PUMP TO PLACE OF USE	TOTAL PUMP OUTPUT (IN CFS)
30 HP	55 PSI	10 feet	15	1.20cfs

4. Provide pump calculations:

$(\text{Horsepower}) * (\text{Efficiency}) / (\text{Total Dynamic Head}) = Q \text{ (cfs)}$
 $[(30 \text{ HP}) * (6.61)] / [25 + (55 / 0.433) * 1.1] = 1.20 \text{ (cfs)}$
 See attached pump and headloss calculations

5. Measured Pump Capacity (using meter if meter was present and system was operating)

INITIAL METER READING	ENDING METER READING	DURATION OF TIME OBSERVED	TOTAL PUMP OUTPUT (IN CFS)
524147	532114 (0.001 ac-feet)	96 hours	1.0 cfs

Reminder: For pump calculations use the reference information at the end of this document.

B. Gravity Flow Pipe

(THE DEPARTMENT TYPICALLY USES THE HAZEN-WILLIAM'S FORMULA FOR A GRAVITY FLOW PIPE SYSTEM)

1. Does the diversion involve a gravity flow pipe? NO

If "NO", items 2 through 4 relating to this section may be deleted.

C. Gravity Flow Canal or Ditch

(THE DEPARTMENT TYPICALLY USES MANNING'S FORMULA FOR CANALS AND DITCHES)

1. Does the diversion involve a gravity flow ditch or canal? NO

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D. Additional notes or comments related to the system:

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The current irrigation system is comprised of temporary pump and motor with fish screen and a track mounted Big Gun. During the irrigation this summer, the original meter was not operating correctly and was replaced during the irrigation period.

Change #2

Change in POA(s) or Additional POA(s)

Did the transfer order authorize a change in the points of appropriation or additional points of appropriation? **NO**

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Change #3
Change in Place of Use

Did the transfer order authorize a change in the place of use?

YES

If "NO", this Section can be deleted.

1. Claim Summary – Authorized Use:

If Irrigation or Nursery Use:

THE # OF ACRES ALLOWED	THE # OF ACRES DEVELOPED
74.9 Acres	74.9 acres

If the new use(s) was not irrigation or nursery:

NEW USE(S)	WAS THE NEW PLACE OF USE DEVELOPED TO THE FULL EXTENT AUTHORIZED UNDER THE ORDER? (INCLUDE THE LOCATION OF THE DEVELOPED PLACE USE ON THE CLAIM MAP)
	NA

2. Variations:

Was the use developed differently from what was authorized by the transfer final order? **NO**

If yes, describe below.

(e.g. "The order authorized a change in place of use for 40 acres. The water user only developed 38 acres.")

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Change #4

Change in Character of Use

Did the transfer order authorize a change in character of use?

NO

Change #5

Change in Character of Use – Reservoir

Did the transfer order authorize a change in character of use for a reservoir?

NO

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SECTION 4

CONDITIONS

All conditions contained in the transfer final order, or any extension final order shall be addressed. Reports that do not address all performance related conditions will be returned.

1. Time Limits:

Describe how the water user has complied with each of the development timelines established in the transfer final order and any extensions of time issued for the transfer:

	DATE FROM TRANSFER	DATE THE AUTHORIZED CHANGES WERE COMPLETED *THIS DATE MUST FALL BETWEEN THE "ISSUANCE DATE" AND THE "COMPLETENESS DATE"
ISSUANCE DATE	April 26, 2024	
COMPLETENESS DATE FROM ORDER (C)	October 1, 2024	June 30, 2024

* MUST BE WITHIN PERIOD BETWEEN TRANSFER FINAL ORDER, OR ANY EXTENSION FINAL ORDER ISSUANCE AND THE DATE TO COMPLETE THE CHANGE

2. Is there an extension final order(s)? NO

3. Measurement Conditions:

a. Does the transfer final order, or any extension final order require the installation of a meter or other approved measuring device? YES

If "NO", items b through f relating to this section may be deleted.

Reminder: If a meter or approved measuring device was required, the COBU map must indicate the location of the device in relation to the point of appropriation.

b. Has a meter been installed? YES

c. Meter Information

POD/POA NAME OR #	MANUFACTURER	SERIAL #	CONDITION (WORKING OR NOT)	CURRENT METER READING	DATE INSTALLED
POD #3	McCrometer	N/A	Yes	532114	June 2024

4. Recording and reporting conditions

a. Is the water user required to report the water use to the Department?

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5. Fish Screening

a. Are any points of diversion required to be screened to prevent fish from entering the point of diversion? YES

If "NO", items b through e relating to this section may be deleted.

Reminder: If fish screening devices were required, the COBU map must indicate their location in relation to the point of diversion.

b. Has the fish screening been installed? **YES**

c. When was the fish screening installed?

DATE	BY WHOM
June 2024	Wesley Van Dyke – Flying V Ranch LLC

Reminder: If the permit or transfer final order was issued on or after February 1, 2011, the fish screen is required to be approved by the Oregon Department of Fish and Wildlife regardless of the rate of diversion.

d. If the diversion **involves a pump *and*** the total diversion rate of all rights at the point of diversion is less than 225 gpm (0.5 cfs) and the permit was issued prior to February 1, 2011:

- Has the self-certification form previously been submitted to the Department? **NA**

If not, go to <https://www.oregon.gov/OWRD/Forms/Pages/default.aspx>, complete and attach a copy of the 'ODFW Small Pump Screen Self Certification' form to this claim, and send a copy of it to the Oregon Department of Fish and Wildlife (ODFW).

Reminder: Failure to submit evidence of a timely installed fish screen may result in an unfavorable determination. The ODFW self certification form needs to have been previously submitted or be attached to this form.

e. If the diversion does **not involve a pump *or*** the total diversion rate of all rights at the point of diversion is 225 gpm (0.5 cfs) or greater:

- Has the ODFW approval been previously submitted?

If not, contact and work with ODFW to ensure compliance. To demonstrate compliance, provide signed documentation from ODFW. A form is available at:

<https://www.oregon.gov/OWRD/Forms/Pages/default.aspx>

Reminder: Failure to submit evidence of a timely installed fish screen may result in an unfavorable determination. In order to receive a favorable approval, the ODFW/WRD "Fish Screen Inspection" form needs to have been previously submitted or be attached to this form.

6. By-pass Devices

a. Are any points of diversion required to have a by-pass device to prevent fish from entering the point of diversion? **NO**

7. Other conditions required by the transfer final order or extension final order:

a. Were there special well construction standards? **NO**

b. Was submittal of a ground water monitoring plan required? **NO**

c. Other conditions? **NO**

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If "YES" to any of the above, identify the condition and describe the water user's actions to comply with the condition(s):

SECTION 5
ATTACHMENTS

Provide a list of any additional documents you are attaching to this report:

ATTACHMENT NAME	DESCRIPTION
T-13695 COBU Map	Transfer Application Map
T-13695 COBU Calculations	COBU Calculations

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SECTION 6

CLAIM OF BENEFICIAL USE MAP

The Claim of Beneficial Use Map must be submitted with this claim. Claims submitted without the Claim of Beneficial Use map will be returned. The map shall be submitted on polyester film at a scale of 1" = 1320 feet, 1" = 400 feet, or the original full-size scale of the county assessor map for the location.

The changes that were authorized under the transfer final order must be mapped based on the developed locations; new or additional points of appropriation and place of use.

In cases where the order involved additional points of appropriation, the additional points should be mapped based on their developed locations. The original points of appropriation should be mapped based on the original right of record at the time the transfer final order was issued.

In cases where the order involved changing the place of use for a portion of a water right, the portion of the place of use being changed should be mapped based on the developed location. If the transfer also included portions of the place of use that were not being modified, but were receiving a new or additional point of appropriation, the place of use for those lands should be mapped based on the original right of record at the time the transfer final order was issued.

Provide a general description of the survey method used to prepare the map. Examples of possible methods include, but are not limited to, a traverse survey, GPS, or the use of aerial photos. If the basis of the survey is an aerial photo, provide the source, date, series and the aerial photo identification number.

Mapping linework was based on Metro RLIS GIS data and Metro provided aerial photography dated 2020.

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Map Checklist

Please be sure that the map you submit includes ALL the items listed below.

(Reminder: Incomplete maps and/or claims may be returned.)

- Map on polyester film
- Appropriate scale (1" = 400 feet, 1" = 1320 feet, or the original full-size scale of the county assessor map)
- Township, Range, Section, Donation Land Claims, and Government Lots
- If irrigation, number of acres irrigated within each projected Donation Land Claims, Government Lots, Quarter-Quarters
- Locations of fish screens and/or fish by-pass devices in relationship to point of diversion
- Locations of meters and/or measuring devices in relationship to point of diversion or appropriation
- Conveyance structures illustrated (pumps, reservoirs, pipelines, ditches, etc.)
- Point(s) of diversion or appropriation (illustrated and coordinates)
- Tax lot boundaries and numbers
- Source illustrated if surface water
- Disclaimer ("This map is not intended to provide legal dimensions or locations of property ownership lines")
- Application and permit number or transfer number
- North arrow
- Legend
- CWRE stamp and signature

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SPRING HILL WATER RIGHTS (T-13695)
CLAIM OF BENEFICIAL USE CALCULATIONS

By: ASZ
DATE: 9/17/2024
PAGE: 1 of 1

ASSUMPTIONS:

- LIFT FROM SOURCE TO PUMP = 10 feet
- LIFT FROM HEAD TO PLACE OF USE = 15 feet
⇒ TOTAL DYNAMIC HEAD = **25 feet**
- EFFECTIVE LENGTH OF 6" SUPPLY PIPE = **3,200'**
(including fitting losses)
- FLOW RATE = 0.944 cfs ⇒ (x 449 gpm/cfs) = **425 gpm**
- BIG GUN TAPOR BORE 1.4 inch Dia.

ANALYSIS

OPERATING PRESSURE FOR BIG GUN @ 425 gpm = 55 psi (per spec)
 $55 \text{ psi} \times \frac{2.31 \text{ ft}}{\text{psi}} = \text{127 feet of Head}$

PIPE LOSSES: $1.21 \text{ ft}/100 \text{ ft pipe} = 3,200/100 \times 1.21 = \text{39 ft}$

PUMP PERFORMANCE FOR 30 HP Pump Model B3Z-L
PER PUMP CURVE @ 425 gpm ⇒ **195 feet of Head**

IS PIPE PERFORMANCE @ 425 gpm GREATER THAN
REQUIRED DYNAMIC HEAD + LOSSES
(TDH)

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PUMP PERFORMANCE - TDH - PIPE LOSSES - Operating Head
195 ft 25 ft - 39 ft 127 ft

$195 - 25 - 39 - 127 = \text{4'}$

PUMP CAPACITY @ 425 gpm IS GREATER THAN Operating Head + LOSSES



CENTRIFUGAL PUMPS

B SERIES

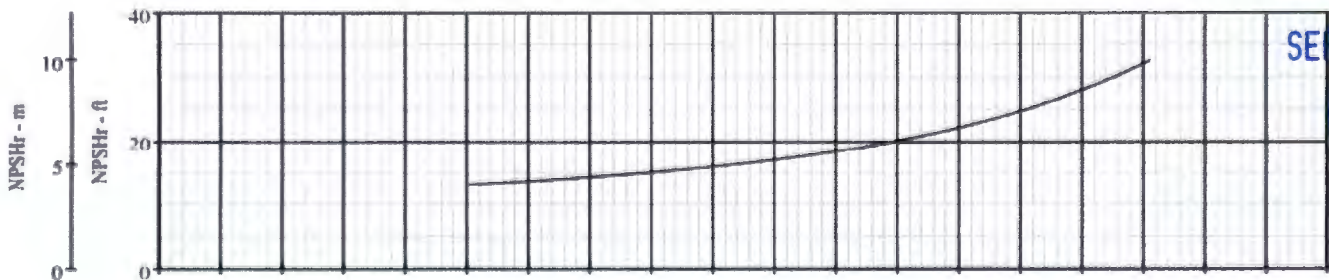
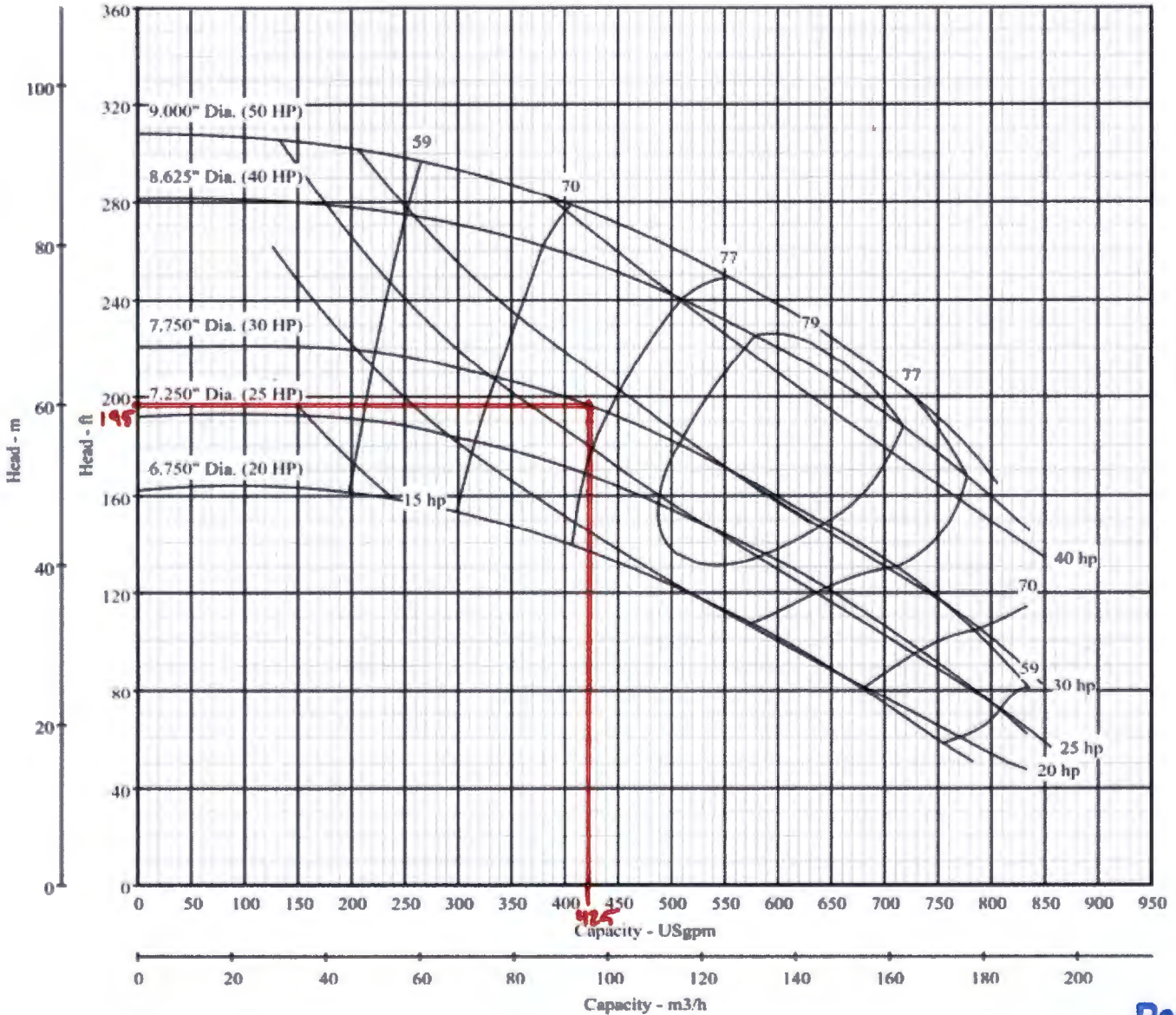
Pump Size: 3 x 4 x 9 L

Model: B3Z_L

Curve No. 5006

Type	CCMD	FM CPLG	FM BELT	SAE	Hydraulic	AC Engine
Model	B3ZPL					

Nominal RPM: **3550**
 Based on Fresh Water@ **68 deg. F.**
 Maximum Working Pressure: **250 PSI**



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CAMERON HYDRAULIC DATA

Friction of Water

6 Inch—Asphalt-dipped cast iron and new steel pipe
Ft per 100 ft

Flow U S gal per min	Asphalt-dipped cast iron			Std wt steel sch 40			Extra strong steel sch 80			Schedule 160—steel		
	6.0" inside dia			6.065" inside dia			5.761" inside dia			5.167" inside dia		
	Ve- locity ft per sec	Ve- locity head ft	Head loss ft per 100 ft	Ve- locity ft per sec	Ve- locity head ft	Head loss ft per 100 ft	Ve- locity ft per sec	Ve- locity head ft	Head loss ft per 100 ft	Ve- locity ft per sec	Ve- locity head ft	Head loss ft per 100 ft
50	.57	.005	.027	.56	.005	.025	.62	.01	.032	.759	.009	.053
60	.68	.007	.038	.67	.007	.034	.74	.01	.044	.911	.013	.073
70	.79	.010	.048	.78	.009	.045	.86	.01	.058	1.06	.018	.096
80	.91	.013	.062	.89	.012	.057	.96	.01	.074	1.22	.023	.123
90	1.02	.016	.077	1.00	.018	.071	1.11	.02	.091	1.37	.029	.152
100	1.13	.020	.094	1.11	.019	.086	1.23	.02	.110	1.52	.036	.184
120	1.36	.029	.132	1.33	.028	.120	1.48	.03	.154	1.82	.052	.256
140	1.59	.039	.176	1.55	.038	.156	1.72	.05	.203	2.13	.070	.340
160	1.82	.051	.228	1.78	.049	.202	1.97	.06	.260	2.43	.092	.435
180	2.04	.065	.283	2.00	.062	.251	2.22	.08	.323	2.73	.116	.522
200	2.27	.080	.346	2.22	.077	.304	2.48	.09	.392	3.04	.143	.635
220	2.50	.097	.415	2.44	.093	.363	2.71	.11	.451	3.34	.173	.760
240	2.72	.115	.490	2.66	.110	.411	2.96	.14	.530	3.64	.206	.895
260	2.95	.135	.571	2.89	.130	.477	3.20	.16	.616	3.95	.242	1.04
280	3.18	.157	.658	3.11	.150	.548	3.45	.19	.708	4.25	.281	1.20
300	3.40	.180	.752	3.33	.172	.624	3.69	.21	.807	4.56	.322	1.36
320	3.63	.205	.851	3.55	.196	.705	3.94	.24	.911	4.86	.366	1.54
340	3.86	.231	.957	3.78	.222	.790	4.19	.27	1.02	5.16	.414	1.73
360	4.08	.259	1.07	4.00	.240	.880	4.43	.31	1.14	5.47	.464	1.93
380	4.31	.289	1.19	4.22	.277	.975	4.68	.34	1.26	5.77	.517	2.14
400	4.54	.320	1.31	4.44	.307	1.07	4.93	.38	1.39	6.07	.572	2.36
450	5.10	.403	1.65	5.00	.388	1.34	5.54	.48	1.74	6.82	.725	2.95
500	5.67	.500	2.02	5.55	.479	1.64	6.16	.59	2.13	7.59	.894	3.61
550	6.24	.605	2.44	6.11	.580	1.97	6.77	.71	2.55	8.35	1.08	4.34
600	6.81	.720	2.89	6.66	.690	2.33	7.39	.85	3.02	9.11	1.29	5.13
650	7.37	.845	3.38	7.22	.810	2.71	8.00	.99	3.52	9.87	1.51	5.99
700	7.94	.980	3.90	7.77	.939	3.13	8.63	1.16	4.08	10.63	1.75	6.92
750	8.51	1.12	4.47	8.33	1.08	3.57	9.24	1.33	4.64	11.39	2.01	7.91
800	9.08	1.28	5.07	8.88	1.23	4.04	9.85	1.51	5.25	12.15	2.29	8.96
850	9.64	1.44	5.72	9.44	1.38	4.55	10.5	1.7	5.90	12.91	2.59	10.1
900	10.2	1.62	6.40	9.99	1.55	5.08	11.1	1.9	6.60	13.67	2.90	11.3
950	10.8	1.80	7.11	10.5	1.73	5.64	11.7	2.1	7.33	14.42	3.23	12.5
1000	11.3	2.00	7.87	11.1	1.92	6.23	12.3	2.4	8.09	15.18	3.58	13.8
1100	12.5	2.42	9.50	12.2	2.32	7.49	13.5	2.8	9.74	16.71	4.33	16.7
1200	13.8	2.88	11.3	13.3	2.76	8.87	14.8	3.4	11.5	18.22	5.15	19.8
1300	14.7	3.38	13.2	14.4	3.24	10.4	16.0	4.0	13.5	19.74	6.05	23.1
1400	15.9	3.92	15.3	15.5	3.76	12.0	17.2	4.8	15.6	21.26	7.01	26.7
1500	17.0	4.50	17.5	16.7	4.31	13.7	18.5	5.3	17.8	22.78	8.05	30.6
1600	18.2	5.12	19.9	17.8	4.91	15.6	19.7	6.0	20.3	24.29	9.16	34.7
1700	19.3	5.78	22.4	18.9	5.54	17.5	20.9	6.8	22.8	25.81	10.34	39.1
1800	20.4	6.46	25.1	20.0	6.21	19.6	22.2	7.7	25.5	27.33	11.59	43.8
1900	21.6	7.22	28.0	21.1	6.91	21.8	23.4	8.4	28.4	28.85	12.92	48.7
2000	22.7	8.00	31.0	22.2	7.67	24.1	24.8	9.4	31.4	30.37	14.31	53.9
2200	25.0	9.68	37.4	24.4	9.27	29.1	27.1	11.4	37.9	33.40	17.32	65.0
2400	27.2	11.5	44.5	26.6	11.0	34.5	29.6	13.8	44.9	36.44	20.81	77.2

FRICITION

Friction of Water

8 Inch—Asphalt-dipped cast iron and new steel pipe
Ft per 100 ft

Flow U S gal per min	Asphalt-dipped cast iron			Std wt steel sch 40			Extra strong steel sch 80			Schedule 160—steel		
	8.0" inside dia			7.991" inside dia			7.825" inside dia			8.813" inside dia		
	Ve- locity ft per sec	Ve- locity head ft	Head loss ft per 100 ft	Ve- locity ft per sec	Ve- locity head ft	Head loss ft per 100 ft	Ve- locity ft per sec	Ve- locity head ft	Head loss ft per 100 ft	Ve- locity ft per sec	Ve- locity head ft	Head loss ft per 100 ft
130	.83	.011	.037	.83	.011	.036	.91	.01	.046	1.14	.020	.079
140	.89	.012	.042	.90	.013	.042	.98	.01	.052	1.23	.024	.090
150	.96	.014	.048	.96	.014	.047	1.05	.02	.059	1.32	.027	.102
160	1.02	.016	.054	1.03	.018	.053	1.12	.02	.066	1.41	.031	.115
170	1.08	.018	.060	1.09	.018	.059	1.19	.02	.074	1.50	.035	.128
180	1.15	.021	.067	1.15	.021	.066	1.26	.02	.082	1.56	.039	.142
190	1.21	.023	.074	1.22	.023	.073	1.33	.03	.091	1.67	.043	.157
200	1.28	.025	.082	1.28	.026	.080	1.41	.03	.099	1.78	.046	.172
220	1.40	.031	.098	1.41	.031	.095	1.55	.04	.118	1.94	.056	.205
240	1.53	.037	.115	1.54	.037	.111	1.69	.04	.139	2.11	.069	.241
260	1.68	.043	.134	1.67	.043	.128	1.83	.05	.161	2.29	.081	.279
280	1.79	.050	.154	1.80	.050	.147	1.97	.06	.184	2.46	.094	.320
300	1.91	.057	.175	1.92	.058	.167	2.11	.07	.209	2.64	.108	.359
350	2.23	.077	.235	2.24	.089	.222	2.46	.09	.276	3.08	.147	.467
400	2.55	.101	.303	2.57	.102	.284	2.81	.12	.343	3.52	.192	.601
450	2.87	.128	.380	2.89	.129	.341	3.18	.15	.428	3.96	.243	.750
500	3.19	.158	.465	3.21	.160	.416	3.51	.19	.522	4.40	.301	.916
550	3.51	.191	.559	3.53	.193	.497	3.86	.23	.625	4.84	.364	1.10
600	3.83	.228	.661	3.85	.230	.586	4.22	.28	.736	5.28	.433	1.30
650	4.15	.267	.772	4.17	.271	.682	4.57	.32	.857	5.72	.508	1.51
700	4.47	.310	.891	4.49	.313	.785	4.92	.38	.986	6.16	.589	1.74
750	4.79	.356	1.02	4.81	.360	.895	5.27	.43	1.13	6.60	.676	1.98
800	5.11	.405	1.18	5.13	.409	1.01	5.62	.49	1.27	7.04	.769	2.24
850	5.42	.457	1.30	5.45	.482	1.14	5.97	.55	1.43	7.48	.869	2.52
900	5.74	.513	1.45	5.77	.518	1.27	6.32	.62	1.59	7.92	.974	2.81
950	6.06	.571	1.61	6.09	.577	1.40	6.67	.69	1.77	8.36	1.09	3.12
1000	6.38	.633	1.78	6.41	.639	1.55	7.03	.77	1.95	8.80	1.20	3.45
1100	7.02	.766	2.15	7.05	.773	1.86	7.83	.95	2.34	9.68	1.46	4.14
1200	7.66	.911	2.55	7.70	.920	2.20	8.43	1.10	2.77	10.56	1.73	4.91
1300	8.30	1.07	2.96	8.34	1.08	2.56	9.13	1.30	3.23	11.44	2.03	5.73
1400	8.93	1.24	3.45	8.98	1.25	2.96	9.83	1.5	3.73	12.32	2.36	6.62
1500	9.57	1.42	3.95	9.62	1.44	3.38	10.5	1.7	4.26	13.20	2.71	7.57
1600	10.2	1.62	4.48	10.3	1.64	3.83	11.2	2.0	4.83	14.08	3.08	8.58
1800	11.5	2.05	5.85	11.5	2.07	4.81	12.8	2.5	6.07	15.84	3.90	10.8
2000	12.8	2.53	6.96	12.8	2.56	5.91	14.1	3.1	7.46	17.60	4.81	13.3
2200	14.0	3.06	8.40	14.1	3.09	7.11	15.5	3.7	8.98	19.36	5.82	16.0
2400	15.3	3.65	9.96	15.4	3.68	8.43	16.9	4.4	10.6	21.12	6.92	19.0
2600	16.8	4.28	11.7	16.7	4.32	9.85	18.3	5.2	12.4	22.88	8.13	22.2
2800	17.9	4.96	13.6	18.0	5.01	11.4	19.7	6.0	14.4	24.64	9.43	25.7
3000	19.1	5.70	15.5	19.2	5.75	13.0	21.1	6.9	16.5	26.40	10.82	29.4
3500	22.3	7.70	21.1	22.4	8.9	17.6	24.8	9.4	22.3	30.80	14.73	39.8
4000	25.5	10.1	27.4	25.7	10.2	22.9	28.1	12.3	29.0	35.20	19.23	51.8
4500	28.7	12.8	34.7	28.9	12.9	28.9	31.6	15.5	36.8	39.60	24.34	65.4
5000	31.9	15.8	42.7	32.1	16.0	35.6	35.1	19.1	45.0	44.00	30.05	80.6
5500	35.1	19.1	51.7	35.3	19.3	43.0	38.8	23.2	54.4	48.40	36.36	97.3

HL for 425 gpm = $\left(\frac{1.34 - 1.07}{2}\right) + 1.07 = 1.21 \text{ ft}/100 \text{ ft}$

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Performance: US Units

150 SERIES

TAPER BORE NOZZLE: 24° Trajectory

Pressure PSI	0.7 in 17.8 mm		0.8 in 20.3 mm		0.9 in 22.9 mm		1 in 25.4 mm		1.1 in 27.9 mm		1.2 in 30.5 mm		1.3 in 33.0 mm		1.4 in 35.6 mm	
	gpm	Rad. (ft)	gpm	Rad. (ft)	gpm	Rad. (ft)	gpm	Rad. (ft)	gpm	Rad. (ft)	gpm	Rad. (ft)	gpm	Rad. (ft)	gpm	Rad. (ft)
50	100	125	130	135	165	145	205	155	255	165	300	173	350	180	408	187
60	110	133	143	143	182	153	225	163	275	173	330	183	385	190	446	198
70	120	140	155	150	197	160	245	170	295	180	355	190	415	198	483	206
80	128	145	165	155	210	168	260	178	315	188	380	198	445	205	516	214
90	135	150	175	160	223	173	275	183	335	195	405	205	475	213	547	221
100	143	155	185	165	235	178	290	188	355	200	425	210	500	220	577	229
110	150	160	195	170	247	183	305	193	370	205	445	215	525	225	605	236
120	157	165	204	175	258	188	320	198	385	210	465	220	545	230	632	241

65 psi → 127 ft

TAPER RING NOZZLE: 24° Trajectory

Pressure PSI	0.71 in 18.0 mm		0.75 in 19.0 mm		0.79 in 20.0 mm		0.83 in 21.0 mm		0.87 in 22.0 mm		0.91 in 23.0 mm		0.94 in 24.0 mm		0.98 in 25.0 mm		1.02 in 26.0 mm		1.06 in 27.0 mm		1.10 in 28.0 mm		1.14 in 29.0 mm		1.18 in 30.0 mm	
	gpm	Rad. (ft)	gpm	Rad. (ft)	gpm	Rad. (ft)	gpm	Rad. (ft)	gpm	Rad. (ft)	gpm	Rad. (ft)	gpm	Rad. (ft)	gpm	Rad. (ft)	gpm	Rad. (ft)	gpm	Rad. (ft)	gpm	Rad. (ft)	gpm	Rad. (ft)	gpm	Rad. (ft)
50	88	119	99	123	111	127	123	131	135	135	149	139	164	145	179	147	196	151	214	155	233	159	253	163	274	167
60	97	125	109	130	121	134	134	138	148	142	163	147	179	151	196	155	214	159	234	163	255	167	277	172	301	176
70	105	134	117	138	131	142	144	146	159	150	176	154	194	158	212	162	231	166	253	170	276	175	300	179	325	183
80	112	135	126	140	140	145	154	150	170	155	188	160	207	165	226	169	247	173	271	178	295	182	320	187	347	191
90	118	140	133	145	148	150	164	155	181	160	199	165	220	170	241	175	262	179	287	184	313	189	340	194	368	198
100	125	144	141	149	156	154	173	160	191	165	210	170	231	175	254	179	277	183	303	188	330	193	358	198	388	203
110	131	150	147	155	164	160	181	165	200	170	220	175	243	180	266	184	290	188	317	194	346	199	375	204	407	208
120	137	155	154	160	171	165	189	170	209	175	230	180	253	185	277	189	303	193	331	199	361	204	392	209	425	213

TAPER RING NOZZLE: 24° Trajectory

Pressure PSI	1.22 in 31.0 mm		1.26 in 32.0 mm		1.30 in 33.0 mm		1.34 in 34.0 mm	
	gpm	Rad. (ft)	gpm	Rad. (ft)	gpm	Rad. (ft)	gpm	Rad. (ft)
50	296	170	319	174	344	177	369	179
60	325	180	350	184	377	187	405	189
70	351	187	378	191	407	194	437	197
80	375	195	404	199	435	202	467	205
90	398	202	429	206	461	209	495	212
100	419	207	452	212	486	215	522	218
110	440	213	474	217	510	220	548	223
120	459	218	495	222	533	225	572	229

RING NOZZLE: 24° Trajectory

Pressure PSI	0.86 in 21.8 mm		0.97 in 24.6 mm		1.08 in 27.4 mm		1.18 in 30.0 mm		1.26 in 32.0 mm		1.34 in 34.0 mm		1.41 in 35.8 mm	
	gpm	Rad. (ft)	gpm	Rad. (ft)	gpm	Rad. (ft)	gpm	Rad. (ft)	gpm	Rad. (ft)	gpm	Rad. (ft)	gpm	Rad. (ft)
50	100	123	130	133	165	143	205	150	255	160	300	168	350	175
60	110	130	143	140	182	150	225	158	275	168	330	175	385	183
70	120	135	155	145	197	155	245	165	295	175	355	183	415	190
80	128	140	165	150	210	160	260	170	315	180	380	190	445	198
90	135	145	175	155	223	165	275	175	335	185	405	195	475	203
100	143	150	185	160	235	170	290	180	355	190	425	200	500	208
110	150	155	195	165	247	175	305	185	370	195	445	205	525	213
120	157	158	204	168	258	180	320	190	385	200	465	210	545	218

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